

SYMPTOMS ASSOCIATED WITH *APHELENCHOIDES FRAGARIAE* AND *PSEUDOMONAS CICHORII* INFECTIONS OF PHILIPPINE VIOLET.

P. S. Lehman and J. W. Miller¹

Philippine violet, *Barleria cristata* L., is a flowering ornamental used in outdoor landscaping in Florida (Fig. 1). In December 1987, a severe foliar disease was observed on several hundred Philippine violet plants in a Florida nursery (Fig. 2). A nematode, *Aphelenchoides fragariae* (Ritzema Bos) Christie, and a bacterium, *Pseudomonas cichorii* (Swingle) Stapp, were isolated from lesions on these diseased plants. Although *P. cichorii* is known to cause foliar lesions on numerous vegetables and ornamental plants, and *A. fragariae* has been reported on several hundred hosts, to our knowledge this is the first report of the association of these two organisms in a disease problem (1,2). For this reason, several experiments were conducted to determine the role of these organisms alone and in combination. The purpose of this circular is to provide information on how to differentiate possible infections by each of these organisms on Philippine violet, based on the type and progression of symptoms.

Symptoms caused by *Pseudomonas cichorii*: The bacterium causes black angular lesions on Philippine violet leaves two days after inoculation (Fig. 3). The coloration of these lesions gradually changes. Approximately two weeks after

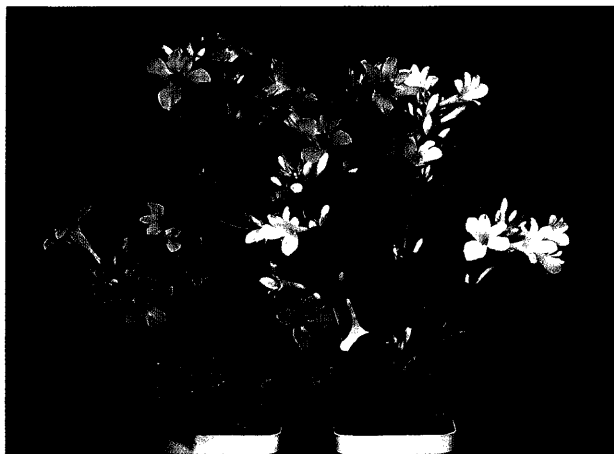


Fig. 1. Philippine violet, *Barleria cristata* plants with purple flowers (left) and white flowers (right). (Photo by J. Lotz)



Fig. 2. Symptoms on plants naturally infected with *Pseudomonas cichorii* and *Aphelenchoides fragariae*. (Photo by J. Lotz)

¹Nematologist, Bureau of Nematology, and Plant Pathologist, Bureau of Plant Pathology, respectively, P.O. Box 1269, Gainesville, FL 32602

inoculation the central portion of most lesions is chocolate-brown in color, surrounded by a purplish-black border. A chlorotic halo is evident around some but not all lesions (Fig. 4). With time the center of the lesion becomes light-brown or tan in color, especially in larger lesions (Fig. 5). Only very small lesions, (<2 mm in diameter) remain black in color. Severe infection by bacteria causes leaf drop, especially if the bacterial lesions coalesce and infect the midvein or the petiole (Fig.6).



Fig. 3. Black angular lesions caused by *Pseudomonas cichorii*. Photo 7 days after inoculation. (Photo by J. Lotz)

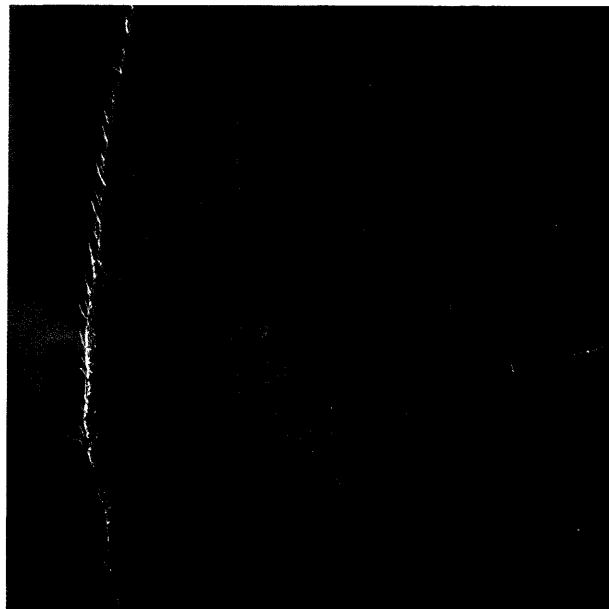


Fig. 4. Black angular lesion with chlorotic halo. Photo 7 days after inoculation with *Pseudomonas cichorii*. (Photo by J. Lotz)

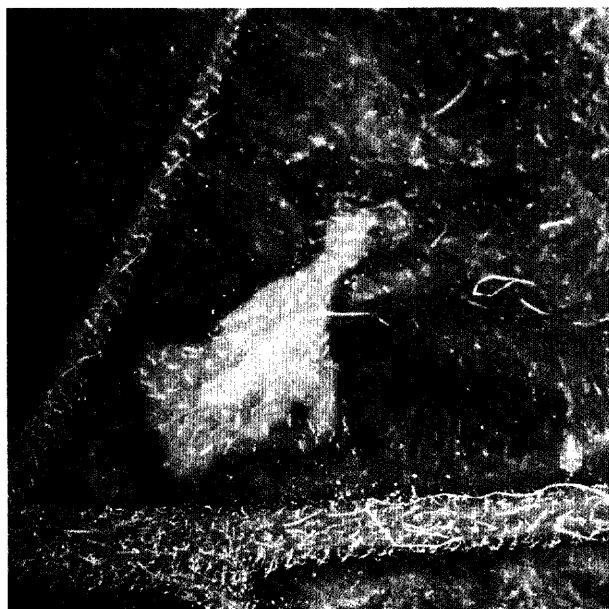


Fig. 5. Typical coloration of a bacterial lesion 6 to 8 weeks after inoculation. (Photo by J. Lotz)

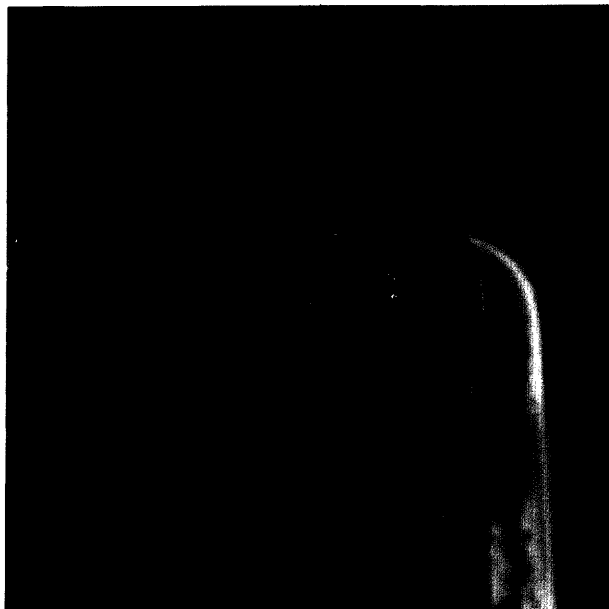


Fig. 6. Infection of a leaf midvein by *Pseudomonas cichorii*. (Photo by J. Lotz)

Symptoms caused by *A. fragariae*: The first symptoms appear on Philippine violet leaves 12-14 days after leaves are inoculated with nematodes. Angular chlorotic areas that are delimited by major veins, i.e. the primary and secondary laterals but not the ultimate veinlets, are readily visible on the upper leaf surface (Fig. 7). Although less apparent, corresponding chlorotic areas are visible on the lower leaf surface. A few days later, pin-point sized necrotic areas become visible in the chlorotic areas. These necrotic lesions enlarge until they occupy an area delimited by the ultimate veinlets. With time these light-brown lesions develop throughout the larger chlorotic areas (Fig. 8). If infection is severe, i.e., if most of the leaf is infected, nematodes may cause these leaves to senesce prematurely and fall from the plant (Fig. 9). After 3-5 weeks most

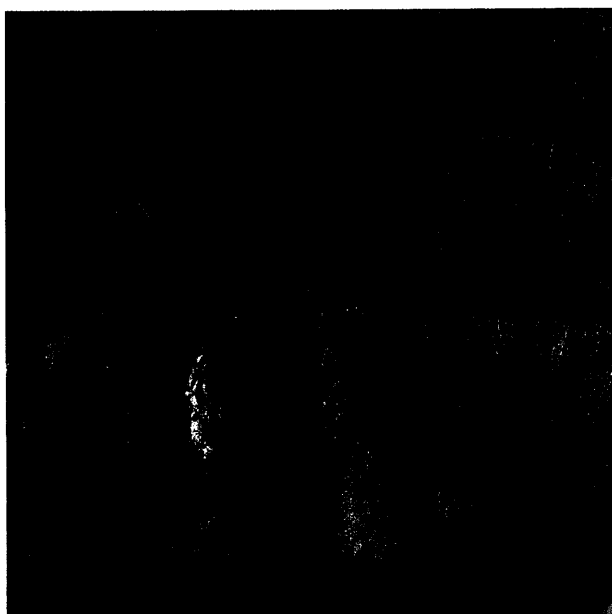


Fig. 7. Angular chlorotic areas caused by *Aphelenchoides fragariae*. Photo 2 weeks after inoculation of leaves with nematodes. (Photo by J. Lotz)

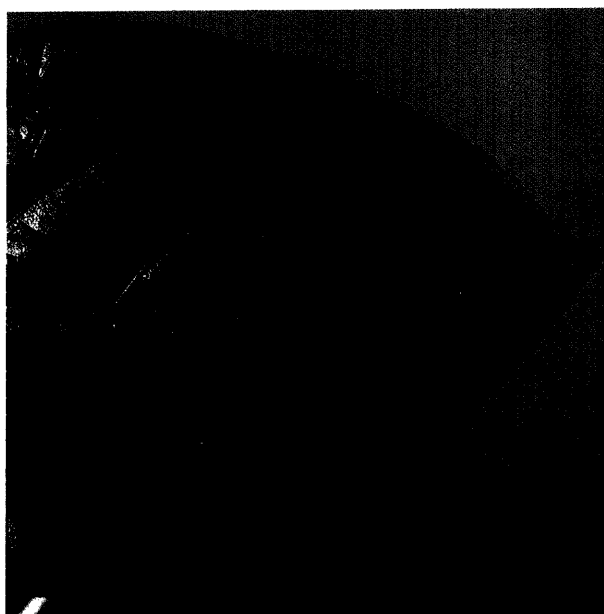


Fig. 8. Necrotic areas caused by *Aphelenchoides fragariae*. (Photo by J. Lotz)



Fig. 9. Symptoms caused by a severe infection of *Aphelenchoides fragariae*. (Photo by J. Lotz)



Fig. 10. Typical coloration of lesions caused by nematodes 8-10 weeks after inoculation. (Photo by J. Lotz)

lesions caused by nematodes change from light brown to dark brown to black on both the upper and lower surface. These older black lesions caused by nematodes are almost identical in appearance to the black angular lesions that bacteria cause several days after infection (Fig. 10).

Symptoms resulting from inoculation with both organisms: When Philippine violet plants are inoculated with *P. cichorii* and *A. fragariae* concomitantly, or with bacteria two or seven days following inoculation with nematodes, the basic types of symptoms caused by these organisms in combination does not differ from those they cause alone. However, light brown necrotic lesions typical of those caused by nematodes appear earlier and in greater numbers on leaves first inoculated with nematodes and then with bacteria seven days later; whereas, leaves inoculated with nematodes and bacteria simultaneously develop fewer lesions. Thus, it is possible that *P. cichorii* may affect the timing and severity of symptoms caused by *A. fragariae*. Positive isolations of *P. cichorii* in light brown lesions, typical of those caused by nematodes, confirmed the possible interactive role of bacteria in increasing the disease severity of nematode infection, if nematode infection preceded bacterial inoculation by a week. Three weeks after leaves were first inoculated with nematodes, bacteria were not isolated from light brown lesions on leaves inoculated with bacteria and nematodes concomitantly, but bacteria were consistently isolated from lesions that developed on leaves inoculated first with nematodes and followed by inoculation with bacteria 7 days later.

Diagnostic summary: If only nematodes are involved, the symptoms begin as chlorotic vein delineated areas which later change to light brown, then dark brown, and finally black. If only the bacterium is the causal agent, the leaf spots become black soon after infection and then the lesions turn a light brown with a purplish-black border. Diffuse chlorotic halos are seen only around bacterial lesions. If both organisms are involved, symptoms are a combination of those caused by each one alone.

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